CONTAINMENT SYSTEMS

## 3/4.6.6 PRIMARY CONTAINMENT ATMOSPHERE CONTROL

### DRYWELL AND SUPPRESSION CHAMBER HYDROGEN RECOMBINER SYSTEMS

### LIMITING CONDITION FOR OPERATION

3.6.6.1 Two independent drywell and suppression chamber hydrogen recombiner systems shall be OPERABLE.

APPLICABILITY: OPERATIONAL CONDITIONS 1 and 2.

ACTION: With one drywell and suppression chamber hydrogen recombiner system inoperable, restore the inoperable system to OPERABLE status within 30 days or be in at least HOT SHUTDOWN within the next 12 hours.

### SURVEILLANCE REQUIREMENTS

4.6.6.1 Each drywell and suppression chamber hydrogen recombiner system shall be demonstrated OPERABLE:

a. At least once per 6 months by verifying during a recombiner system warmup test that the minimum recombiner heater outlet temperature increases to greater than or equal to 500°F within 90 minutes.

b. At least once per 18 months by:

1. Performing a CHANNEL CALIBRATION of all recombiner operating instrumentation and control circuits.

2. Verifying the integrity of all heater electrical circuits by performing a resistance to ground test within 30 minutes following the above required functional test. The resistance to ground for any heater phase shall be greater than or equal to 10,000 ohms.

3. Verifying during a recombiner system functional test that, upon introduction of ~~1%~~ *at least 1%* by volume hydrogen ~~in a 140-180 scfm stream containing at least 1% by volume oxygen, that the catalyst bed temperature rises in excess of 120°F within 20 minutes.~~ *into the catalyst bed preheated to a temperature not to exceed 300°F, the effluent stream has a hydrogen concentration of less than 25 ppm by volume AND THAT THE MAXIMUM TEMPERATURE READING AFTER 20 MINUTES OF OPERATION IS WITHIN ~~THE~~ TOP ~~60%~~ OF THE ~~BED~~ VOLUME.*

*CHANGE REQUESTED BY THIS LETTER*

*CHANGES SUBMITTED IN GO2-92-064*

4. Verifying through a visual examination that there is no evidence of abnormal conditions within the recombiner enclosure; i.e., loose wiring or structural connections, deposits of foreign materials, etc.

c. By measuring the system leakage rate:

1. As a part of the overall integrated leakage rate test required by Specification 3.6.1.2, or

2. By measuring the leakage rate of the system outside of the containment isolation valves at $P_a$, 34.7 psig, on the schedule required by Specifiation 4.6.1.2, and including the measured leakage as a part of the leakage determined in accordance with Specification 4.6.1.2.

ATTACHMENT 2

## 3/4.6.4 VACUUM RELIEF

Vacuum relief breakers are provided to equalize the pressure between the suppression chamber and drywell and between the reactor building and suppression chamber. This system will maintain the structural integrity of the primary containment under conditions of large differential pressures.

The vacuum breakers between the suppression chamber and the drywell must not be inoperable in the open position since this would allow bypassing of the suppression pool in case of an accident. There are nine pairs of valves to provide redundancy and capacity so that operation may continue indefinitely with no more than two pairs of vacuum breakers inoperable in the closed position.

## 3/4.6.5 SECONDARY CONTAINMENT

Secondary containment is designed to minimize any ground level release of radioactive material which may result from an accident. The reactor building and associated structures provide secondary containment during normal operation when the drywell is sealed and in service. At other times the drywell may be open and, when required, secondary containment integrity is specified.

Establishing and maintaining a vacuum in the reactor building with the standby gas treatment system once per 18 months, along with the surveillance of the doors, hatches, dampers, and valves, is adequate to ensure that there are no violations of the integrity of the secondary containment.

The OPERABILITY of the standby gas treatment systems ensures that sufficient iodine removal capability will be available in the event of a LOCA. The reduction in containment iodine inventory reduces the resulting SITE BOUNDARY radiation doses associated with containment leakage. The operation of this system and resultant iodine removal capacity are consistent with the assumptions used in the LOCA analyses. Continuous operation of the system with the heaters OPERABLE for 10 hours during each 31 day period is sufficient to reduce the buildup of moisture on the adsorbers and HEPA filters.

## 3/4.6.6 PRIMARY CONTAINMENT ATMOSPHERE CONTROL

The OPERABILITY of the systems required for the detection and control of oxygen/hydrogen gas ensures that these systems will be available to maintain the oxygen ~~hydrogen~~ concentration within the primary containment below the lower oxygen limit for oxygen/hydrogen mixture ~~its flammable limit~~ during post-LOCA conditions. Either drywell and suppression chamber oxygen/hydrogen recombiner system is capable of controlling the expected oxygen ~~hydrogen~~ generation associated with ~~(1) zirconium-water reactions, (2)~~ radiolytic decomposition of water~~, and (3) corrosion of metals within containment~~. The oxygen/hydrogen control system is consistent with the recommendations of Regulatory Guide 1.7, "Control of Combustible Gas Concentrations in Containment Following a LOCA," September 1976.

Add Insert



CHANGES FROM G02-92-064

Addition for 3/4.6.6 Basis - (will become page B 3/4 6-6)

Following an accident the inerted primary containment oxygen level is controlled to not exceed 4.8% by volume with the catalytic recombiner system. By FSAR Figure 6.2-26 the containment will reach 4.8% oxygen between 10 and 60 hours after the accident if the recombiner system is not operating. To provide assurance that recombiners are capable of achieving the required oxygen removal, the feed and effluent streams will be sampled for the surveillance to establish that the effluent hydrogen concentration is less than 25 ppm by volume for a feed of at least 1% hydrogen by volume. This will confirm a minimum efficiency of 99.75% for the expected range of post-accident conditions. This efficiency will be adequate to maintain the post-accident oxygen level below 4.8% by volume.

CHANGES FROM GDZ-92-64

The CAC system employs a platinum on alumina catalyst to recombine the oxygen and hydrogen flow from the containment. During accident conditions, the gas mixture is preheated to approximately 450 to 550°F prior to entering the catalyst. This preheat increases the effectiveness of the hydrogen/oxygen recombination because it limits the potential for bed poisoning. For testing purposes, the gas mixture will be preheated prior to entering the catalyst to ensure the required activation energy of the recombination is reached. In the test configuration, the blower is used as the only source of gas stream heating and the catalyst preheaters are not energized. The blowers are capable of heating the gas stream by compression. Temperatures at the blower exit are limited for test purposes to approximately 300°F due to the blower gas exit temperature trip setpoint.

SEE INSERT FOR THIS SECTION ON THE NEXT PAGE

# INSERT FOR BASES SECTION 3/4.6.6

The following is the insert addition to the bases revision proposed in the reference.

A known quantity of heat is produced by the reaction of a given mass of hydrogen and oxygen. The temperature change produced by that known quantity of heat is, however, strongly influenced by many factors which are not known with certainty. Calculations made based solely on the temperature data provided by the RTDs in the catalysts bed may result in erroneous conclusions because of these uncertainties. However, a qualitative evaluation is possible by the analysis of the relative temperature gradient through the catalyst bed. This temperature gradient can be provided by the trending of the temperature measurements made during the surveillance tests. Evaluation of the temperature gradient of the bed can also provide indication of poisoning on the catalyst. If these data indicate that the recombination process is occurring near the bottom of the catalyst rather than near the top, evaluation of the capability of the catalyst is needed to determine the ability to meet the design basis accident requirements. Degradation of the catalyst bed will also be indicated by the decreased ability to recombine hydrogen and oxygen. This indication can be determined through the evaluation of the hydrogen content of the influent and effluent. The catalyst bed should maintain a relatively constant capacity for recombination. If the comparison of the influent and effluent hydrogen concentrations begins to indicate a degradation of the catalyst bed, replacement of the bed will be evaluated.